1. For the program below show the value of the variables listed when the program reaches the line with the arrow. Write "undefined" if the value is not defined at that point.

```csharp
class Program
{
    static int x;
    static void Main(string[] args)
    {
        int a;
a = 5;
        int i = 9;
x = 2;
        while(i < 7)
        {
i++;
        }
        for(int k=1;k<10;k++)
        {
a++;
        }
        Console.WriteLine();
    }
}
```

- x = ______________
- a = ______________
- i = ______________
- k = ______________

2. When I run the program below there is an error.
   (A) What is the error?
   int a;
double b = 2, c = 5;
a = c/b;

   (B) Change the third line to fix the error.

3. The following sequence creates a 2-dimensional array of ints and fills it with data. In the space below fill in the correct values that will be in the array after the program runs.

```csharp
int[,] a = {{9,8,7}, {4,5,6}};
int r, c;
for(r=0;r<2;r++)
{
    for(c=0;c<3;c++)
    {
        if(a[r,c] == 1)
            a[r,c] = 0;
        else
            a[r,c] = 1 + r*r + c*c;
    }
}
```

- [ ] [ ]

4. Suppose an array is created using the following:

   int [] arr = {93, 24, 577, 42, 21, 87};
Show how to use a loop to print the array out in reverse order with one element per line.
5. The statement below defines an array. Show how to fill the array with random integers in the range 0 to 100.

```java
int [, ,] a = new int[3, 4, 5];
```

6. Fill in the memory map below and show what is printed by the following program.

```java
static void Main(string[] args)
{
    int a = 1, b = 2, c;
    ConfuseMe(ref a, b, out c);
    Console.WriteLine("{0}, {1}, {2}", a, b, c);
}

private static void ConfuseMe(ref int a, int b, out int c)
{
    int x = a + b;
    b = 4;
    c = 2 * x;
    a = 9;
    Console.WriteLine("{0}, {1}", a, b);
    Console.WriteLine("{0}, {1}", c, x);
}
```

<table>
<thead>
<tr>
<th>Addresses</th>
<th>Printed Results</th>
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</thead>
<tbody>
<tr>
<td>ConfuseMe</td>
<td></td>
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<tr>
<td>Main</td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td></td>
</tr>
</tbody>
</table>

7. Write an overloaded version of the following method definition header.

```java
static private int Method1(int a, ref int b, double c)
```
8. The following statement creates a 1-dimensional array and initializes its values. Write a complete method named `FindZeros(a, out n)` where a is the array and n is an int. The method checks a for zeros and returns the number of zeros in the parameter n.
```csharp
int[] a = {0, 1, 2, 3, 5, 7, 9, 0, 11};
```

9. Write a method which accepts as arguments, a two dimensional array named `a` and an integer named `n`. Your method should find the sum of the array elements on row n and return that value. If `n` is larger than the number of rows in the array, your method should return 0.

10. Write an equivalent `while` loop for the following `for` loop.
```csharp
int i;
for(i=-8;i<=22;i=i+2)
{
    Console.WriteLine(i-1);
    if(i > 5)
    {
        Console.WriteLine(i+1);
    }
}
```
11. The following method does a Bubble sort on a parameter named sortVector. Line numbers have been added to the left for reference purposes. Answer the questions below with regard to this method.

```csharp
private void Sort(int[] sortVector)
{
    bool sorted = false;
    int i, j, k, iTmp;
    while(sorted == false)
    {
        sorted = true;
        for(i=0; i<sortVector.length - 1; i++)
        {
            j = sortVector[i];
            k = sortVector[i+1];
            if(j > k)
            {
                iTmp = sortVector[i];
                sortVector[i] = sortVector[i+1];
                sortVector[i+1] = iTmp;
                sorted = false;
            }
        }
    }
}
```

A) What function do lines 10, 11, and 12 perform?

B) What is the minimum number of times that the while loop beginning in line 4 will run. Consider all cases including the case where sortVector is already sorted. Justify and explain your answer.

C) If sortVector has just 3 elements what is the maximum number of times the while loop beginning in line 4 will run. Justify and explain your answer.

D) What is the purpose of the boolean variable sorted?